Rex Corrumpæ"—appears at the end of his memoir), a real character—a sullen and solitary bear of enormous size, responsible for the deaths of at least two cowboys, and believed never to have had a mate. He was known far and wide over a broad district of New Mexico as "the worst grizzly that ever rolled a log in the Big Horn Basin"; but in the Yellowstone, where for some years he regularly passed two months in summer, and where, as in our London parks—to compare small things with great—wild things at once grow tame, he managed to pass himself off as "a peaceable sort."

From facts gathered from hunters, miners and ranchmen, and from personal experiences, Mr. Thompson has imagined and written his life through "cubhood," "days of strength" and "waning," from the time when he and his two brothers and a sister—an unusually large family for a grizzly—as woolly cubs "hustled and tumbled one another in their haste to be first at the ant-heaps which a mother's strong arm unroofed, and squealed like little pigs, and growled little growls, as if each was a pig, a pup and a kitten all rolled into one," until the time when, a grey-bearded old bear, crippled with rheumatism, dethroned and driven from his haunts by a usurper whom a year or two before he would have despised, he limps "with shaky limbs and short uncertain steps to the mysterious 'Death Gulch'—that fearful little valley where everything was dead and where the very air was deadly," and "as gently went to sleep as he did in his mother's arms by the Gray-Bulls long ago."

It is a powerfully written and wonderfully graphic story, more particularly in the earlier chapters, where the poor little cub, sole survivor of the family, wanders motherless in the woods, with all the world against him, to learn by the slow lessons of experience all about traps and guns and beasts and, worst of all, men, and the meanings of the many subtle messages which reached the brain by way of his "great moist nose," storing up wrath against the day of vengeance, which came with his strength.

One of the most interesting things in the book is the account of the way in which a big bear, when he takes possession of a country, advertises his proprietary rights by rubbing himself, whenever he passes, against particular trees.

> "Wherever Wahb went he put up his sign-board—
> 'TRESPASSERS BEWARE!'
> It was written on the trees as high up as he could reach, and everyone that came by understood that the scent of it and the hair in it were those of the great grizzly Wahb."

A critic, to assert his superiority, must pick holes somewhere. Perhaps in the case of Mr. Seton-Thompson's almost altogether perfect work, the least unreasonable way of doing what is expected is by hinting a doubt whether the vein of melancholy which runs through much of his writings is not a little strained.

"The life of a wild animal," he tells us in italics, "*always has a tragic end.*" Perhaps so; if, but only IF, sudden destruction coming unawares to end a bright existence—Death appearing without "the painful family," "more hideous than their Queen"—is necessarily a tragedy. But the world, after all, is something more than a great slaughter-house. There is, for the humbler creation at least, a "blindness to the future kindly given," and, so far as we can judge, a keen power of enjoying the present. The blackbird is not always thinking of the sparrowhawk, the ant of the turkey, nor the turkey of Christmas. The necessity for keeping the protective sense constantly on the alert may be the very best means for keeping the faculties of enjoyment bright and polished.

"A certain number of fleas," according to David Harum, "is good for a dog. They keep him from brooding on being a dog." T. DIGBY PIGOTT.

ELEMENTARY GEOMETRY.

Elementary Geometry, Plane and Solid, for use in High Schools and Academies. By Thomas F. Holgate, Professor of Applied Mathematics in North-Western University. Pp. xi + 440. (New York: The Macmillan Company. London: Macmillan and Co., Ltd., 1901.) Price 6*s.*

THIS book covers the ground of the first six books and those parts of the eleventh and twelfth books of Euclid which are usually read; and it includes besides a discussion of the elementary properties of the simpler solid figures, the sphere, the cylinder and cone. There is also a brief appendix on trigonometry.

The introduction deals with preliminary notions and definitions, and the first chapter with triangles and parallelograms. The second chapter treats of the circle in a manner which is more direct than Euclid's, and is free from the impossible figures so bewildering to a beginner. It contains an interesting Article 204, on the principle of continuity, in which instances are given of propositions which, though very different at first sight, can by the application of the principle of continuity be harmonised under one general statement. Illustrations of this kind are most helpful and stimulating.

The third chapter, on similar rectilineal figures, contains a section on measurement, ratio, proportion and the theory of limits. As no definite agreement has yet been arrived at among teachers as to the best mode of treating this part of the subject, it is to this section that the main interest of the book is due. There is much to be said for the view of those who would definitely postpone any discussion of incommensurables to a later stage, but as it may be inferred from the book that this is not the view of the author, it will not be considered here. In order to make clear the relation of his treatment to the usual English practice, it is necessary to state very briefly what that practice is. It is usual to direct beginners to learn the fifth definition (the test for equal ratios) by heart without any adequate explanation,[1] although it rests upon ideas of extreme simplicity. It is doubtful whether one pupil in ten thousand understands the definition, though a great many are able to apply it correctly to prove two important propositions in the sixth book, viz., No. 1, "The areas of triangles (and parallelograms) of the same altitude have the same ratio as the lengths of their bases have to one another," and No. 33, "In equal circles, angles, whether at the centres or circumferences, have the same ratio as the arcs on which they stand have to one

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[1] The so-called algebraic explanations frequently supplied are inadequate

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another: so also have the sectors." For the proof of these two propositions *only* is the fifth definition usually employed. All the remaining properties of proportion required for use in the sixth book are either assumed or proved (it would be more correct to say they are supposed to be proved) algebraically. Some teachers, probably a small minority, use the syllabus of the Association for the Improvement of Geometrical Teaching. This syllabus, following Euclid's line of argument, *uses the properties of unequal ratios to prove properties of equal ratios*, thus making the proofs unnecessarily artificial and therefore difficult; so that, though it is quite possible for a clever pupil to follow the reasoning in each separate proposition, it is very difficult for him to grasp the argument as a whole.

In the book under notice the fundamental definitions of the fifth book of Euclid, viz., the test for equal ratios, No. 5, the test for distinguishing between unequal ratios, No. 7, and the definition of the compounding of ratios, with which may be included the definition of duplicate ratio, find no place. And it may be conceded at once that, if these definitions are not properly explained, it is much better that they should not appear in an elementary text-book, because the beginner, to whom the simple ideas on which they rest are not carefully expounded, is far more likely to make progress in geometry with the aid of Prof. Holgate's book than with an ordinary Euclid.

The author, after defining the ratio of two incommensurable magnitudes as the limit of a rational fraction, obtained by a definite process (Art. 229), proves a general theorem on limits, viz., "that if there are two variable quantities dependent on the same quantity in such a way that they remain always equal while each approaches a limit, then their limits are equal" (Art. 230).

With the aid of this, the two propositions, Euc. VI., 1 and 33, already referred to, are proved, and also the proposition "that a straight line parallel to one side of a triangle divides the other two sides in the same ratio," Euc. VI., 2 (first part).

Taking the proof furnished of this last theorem as a type, and leaving out of it the use made of the general theorem on limits quoted above, it may be pointed out that the proof is in effect a demonstration (though some expansion would be necessary to make this clear) of the proposition that if a certain definite process be applied to the segments of each of the sides of the triangle the result will be to determine the same irrational number[1] in each case, so that this irrational number may be taken as the measure of the ratio of the two segments of each side, and that consequently these ratios are equal. With such a change the treatment would accord with modern ideas regarding irrational numbers as set forth by Dedekind in his tract on continuity and irrational numbers[2] and now generally accepted.

But when such propositions as "that if two ratios are equal, their reciprocal ratios are equal" are required (see Arts. 234, 237–240), then the proofs supplied are valid for commensurable ratios only. This change in the mode of treatment should have been clearly indicated in the text or preface. To have proved these propositions on the lines on which the treatment of the subject of ratio had been begun would soon have carried the author beyond the comprehension of those for whom his book was intended. To have proved them upon Euclid's lines would have made it necessary to add a large number of additional explanations. This, however, was the only practicable logical alternative.

The fourth chapter deals with the areas of plane polygons and with the measurement of the circle. Archimedes proved that π lies between $3\frac{1}{7}$ and $3\frac{10}{71}$ by a consideration of the regular inscribed and circumscribed polygons of ninety-six sides. The author obtains a much closer approximation, but finds only a series of values increasing up to π by using the inscribed regular polygons. The result would have been more impressive if a series of values decreasing down to π had been found as well.

The sixth chapter deals with lines and planes in space. It is a matter of opinion whether the modes of constructing the perpendicular to a plane in §§ 403 and 408 are or are not more difficult than Euclid's; but these last are so useful in Spherical Trigonometry that it seems a pity they have not had more prominence given to them than is furnished by § 406. For a similar purpose it would have been useful to give some further account of the angles between a line which meets a plane and the lines in the plane than Prop. xx. in § 449, viz., "The acute angle which a straight line makes with its own projection upon a plane is the least angle it makes with any line of that plane." It is advantageous to know, not only the least and the greatest angles between a fixed line meeting a plane and lines in the plane, but also the way in which the angle varies as the line in the plane revolves.

The statement of Prop. xxii., § 458, "that the sum of any two face angles of a trihedral angle is greater than the third angle," should be limited by inserting the word "convex" before the word "trihedral."

The seventh, eighth and ninth chapters deal with prisms, pyramids, cylinders, cones and spheres.

There are several features of interest in the book, such as the use of the principle of continuity in §§ 204, 264, 323, and the directions given in § 540 for constructing the regular polyhedra. The proofs of many of the propositions seem to be new. The work is evidently that of an experienced teacher, and is written on the lines of good class teaching, in which the teacher suggests steps in the argument to the pupil, and the demonstrations are worked out by both together. The book is calculated to arouse and stimulate those who have at heart the teaching of their subject.

MOSQUITOES AND MALARIA IN MAURITIUS.

Les Moustiques: Anatomie et Biologie. By A. Daruty de Grandpré and D. d'Emmerez de Charmoy. (Port Louis, Mauritius: *Planters' and Commercial Gazette*, 1900.)

THIS work is a contribution to the study of the Culicidæ, and principally of the genera Culex and Anopheles, of their *rôle* in the propagation of malaria

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[1] An irrational number is defined as one which separates all rational fractions into two classes, an upper and a lower, such that
(1) Every fraction in the lower class is less than every fraction in the upper class.
(2) The lower class contains no greatest fraction.
(3) The upper class contains no least fraction.

[2] Translated into English by Prof. Beman. (Chicago: The Open Court Publishing Co., 1901.)

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